CLAIMS

1. A bent axis pump/motor, comprising:

a casing configured to be substantially filled with fluid;

a back plate positioned within the casing; and

a check valve positioned in the back-plate and configured to permit passage of fluid from within the casing and outside of the back plate through the check valve to an interior of the back plate, and further configured to restrict flow of fluid from the interior of the back plate through the check valve.

2. The pump/motor of claim 1, further comprising a first pressurized fluid source pressurized at a first selected pressure, the first source in fluid communication with the casing such that fluid in the casing is substantially at the first selected pressure.

3. The pump/motor of claim 2, further comprising a second pressurized fluid source pressurized at a second selected pressure, higher than the first selected pressure.

4. The pump/motor of claim 1, wherein the interior of the back plate comprises first and second volumes configured to be differentially pressurized, and wherein the check valve is positioned between the exterior of the back plate and the first volume, the pump/motor further comprising an additional check valve also positioned between the exterior of the back plate and the first volume.

5. The pump/motor of claim 1, wherein the interior of the back plate comprises first and second volumes configured to be differentially pressurized, and wherein the check valve is positioned between the exterior of the back plate and the first

volume, the pump/motor further comprising an additional check valve positioned between the exterior of the back plate and the second volume.

6. The pump/motor of claim 1, wherein the check valve is configured to close when pressure within the back plate meets or exceeds pressure outside the back plate.

7. The pump/motor of claim 1, wherein the check valve is configured to close when pressure within the back plate exceeds pressure outside the back plate by a selected value, greater than zero.

8. The bent axis pump/motor of claim 1 wherein the casing includes first and second apertures positioned coaxially on opposite sides of the casing and traversing from the interior of the casing to the exterior thereof, the pump/motor further comprising:

a yoke coupled to the back plate and having first and second trunnions positioned within the first and second apertures, respectively, the yoke configured to rotate on the trunnions around an axis;

first and second bearings positioned between the first and second trunnions and an inner wall of each of the first and second apertures, respectively, the position of each of the first and second bearings being further defined by respective inner and outer planes for each bearing, parallel to each other and transverse to the axis, with the respective bearing positioned therebetween, each of the first and second bearings occupying less than the complete circumference of the respective trunnion; and

third and fourth apertures, the third aperture providing an opening in the first trunnion for passage of fluid therethrough, and positioned between the inner and outer planes for the first bearing thereof, and the fourth aperture providing an opening in

the second trunnion for passage of fluid therethrough, and positioned between the inner and outer planes for the second bearing thereof.

9. The pump/motor of claim 8, further comprising:

first and second fluid supply channels formed integrally with the casing and configured to transmit fluid from fluid switching means to the first and second trunnions, respectively; and

fifth and sixth apertures opening into the first and second apertures of the casing, respectively, and configured to couple the third and fourth apertures with the first and second fluid supply channels, respectively, for passage of fluid from the casing to the first and second trunnions.

10. The pump/motor of claim 9, further comprising a valve positioned within the casing and configured to selectively couple high- and low-pressure fluid supplies to the first and second trunnions via the first and second fluid supply channels.

11. A pump/motor, comprising:

a yoke configured to carry a rotatable barrel;

a trunnion coupled to the yoke and configured to be received by an aperture of a pump casing, and further configured to receive a bearing between the trunnion and a wall of the aperture in a position defined by two parallel planes transverse to an axis of the trunnion; and

a fluid channel passing within the yoke to the trunnion and exiting the trunnion via an aperture positioned between the two planes.

12. The pump/motor of claim 11, further comprising the pump casing having the aperture for receiving the trunnion.

13. The pump/motor of claim 11, further comprising the bearing positioned between the trunnion and the wall of the aperture and between the two parallel planes.

14. The pump/motor of claim 13, wherein the bearing is configured to occupy a portion of a circumference of the trunnion of less than 360°.

15. The pump/motor of claim 14 wherein the bearing has a shape of a section of a cone.

16. The pump/motor of claim 14 wherein the bearing has a shape of a section of a cylinder.

17. The pump/motor of claim 14 wherein the bearing is formed of a bronze alloy.

18. The pump/motor of claim 14 wherein the bearing is impregnated with lubricant.

19. The pump/motor of claim 14 wherein the bearing comprises a cage frame configured to receive needle rollers, and a plurality of needle rollers coupled to the frame.

20. A pump/motor, comprising:

a casing configured to receive components of the pump/motor;

a valve configured to selectively control fluid flow, the valve including a valve body, integral to the casing; and

a first fluid channel, integral to the casing, having a first terminus at the valve and a second terminus at a first fluid port configured to transmit fluid to a first trunnion of the pump/motor.

21. The pump/motor of claim 20 wherein the valve is configured to selectively couple the first fluid channel with high- and low-pressure fluid sources.

22. The pump/motor of claim 20, further comprising a second fluid channel, integral to the casing, having a first terminus at the valve and a second terminus at a second fluid port configured to transmit fluid to a second trunnion of the pump/motor.

23. A hydraulic device, comprising:

a back plate having first and second volumes configured to be differentially pressurized;

means for admitting fluid directly from a region surrounding the back plate to the first volume; and

means for controlling a flow of fluid from the first volume to the region surrounding the back plate.

24. The device of claim 23 wherein the controlling means includes means for preventing fluid from flowing from the first volume to the region surrounding the back plate.

25. The device of claim 23 wherein the controlling means includes means for preventing fluid pressurized at a pressure above a selected pressure from flowing from the first volume to the region surrounding the back plate.

26. The device of claim 23, further comprising means for admitting fluid directly from a region surrounding the back plate to the second volume.

27. A hydraulic device, comprising:

a yoke having first and second coaxial trunnions, the yoke configured to rotate around the common axis of the first and second trunnions;

a first bearing occupying less than a complete circumference of the first trunnion; and

a first trunnion aperture occupying a portion of the circumference of the first trunnion not occupied by the first bearing.

28. The device of claim 27, further comprising a second bearing occupying less than a complete circumference of the second trunnion, and a second trunnion aperture occupying a portion of the circumference of the second trunnion not occupied by the second bearing.

29. A method of operating a pump/motor, comprising:

coupling a first fluid source to a first volume within a back plate of the pump/motor while coupling a second fluid source to a second volume within the back plate, such that an output shaft of the pump/motor is compelled to rotate in a first direction against an inertial load;

while the output shaft is rotating in the first direction, coupling the second fluid source to the first volume and coupling the first fluid source to the second volume, such that rotational force is applied to the output shaft in a second direction, in opposition to the rotation of the shaft; and

drawing fluid into the first volume from a quantity of fluid immediately surrounding the back plate.

30. The method of claim 29 wherein the first fluid source is pressurized at a first pressure, the second fluid source is pressurized at a second pressure, lower than the first pressure, and the quantity of fluid is pressurized at a level substantially equal to the second pressure.